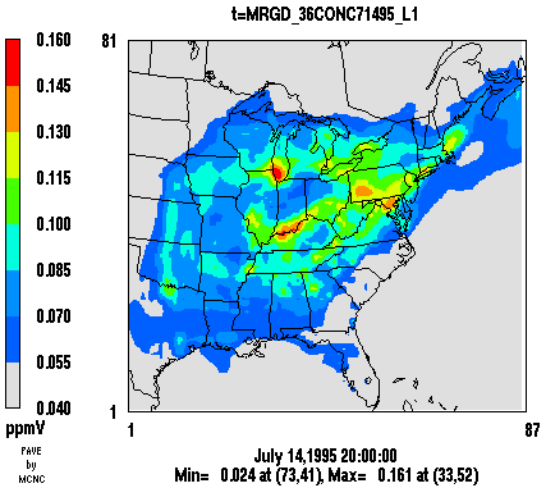
High Performance Computing

February 18, 2004

On February 18, 2004, the U.S. Environmental Protection Agency and Department of Energy signed a Memorandum of Understanding to expand the research collaboration of both agencies to advance biological, environmental, and computational sciences for protecting human health and the environment and fostering a secure, reliable, and economically sustainable energy system. This fact sheet describes a collaborative research area and the expertise each agency brings.

The forward-looking relationship between EPA and DOE is characterized by one of the key areas of collaboration, high performance computing. By networking between EPA in North Carolina and DOE's Sandia National Laboratory in New Mexico, computational sciences and decision-making tools will be taken to a new level of sophistication and utility. Other nodes are planned as well.

CMAQ Layer 1 Results - Ozone



Optimization

High performance computing allows optimization (better, faster, cheaper runs) of environmental models like EPA's Community Multi-Scale Air Quality (CMAQ) model, enhances data storage and transfer of large data sets, and reduces data duplication. In the CMAQ example, performance will be improved for single processor execution, small parallel clusters of processors, and large multi-processor systems. Optimization is targeted to systems used by state and regional agencies who must meet upcoming deadlines on air quality implementation plans in the 2007-2008 timeframe.

New Environmental Quality Tools

As EPA and DOE's scientists explore new research areas, high performance networking will enable more thorough and rapid analysis of large datasets. The end goal is the production, automation and transfer of environmental quality tools. For example, a pilot project planned between EPA's Exposure Research Laboratory and DOE's Sandia National Laboratory involves the evaluation of remote sensing techniques for monitoring water quality. EPA has began investigating the use of remote hyperspectral image data (i.e., very high resolute satellite image data) to determine several water quality parameters, notably chlorophyll a, turbidity, and phosphorus. Reaching technical maturity and implementing this technology on a routine basis will be aided by Sandia's expertise in multivariate data analysis and thermal imaging. EPA will provide DOE with a large set of remote hyperspectral data from one of EPA's current exposure research

programs and related field-collected data for water quality parameters of interest. Together, EPA and DOE will assess their current state of the science, acquire signatures of typical water-born constituents and develop a spectral library, and be poised to automate and transfer multivariate data analysis tools for water quality.

The Office of the Future

DOE and EPA's collaboration will also promote a "Collaboratory" or virtual science laboratory/office without walls, in which researchers and their partners can conduct their science regardless of geographical location. Scientists will have additional options for communication and research including text chat, audio/visual conferencing, multi-site simultaneous and collaborative visualization, laboratory notebooks, and electronic whiteboards to share data plots and visualize modeling results.

Furthering Air Quality and Climate Change Research

Fine particulate matter aerosols have significant air quality, human health, and climate impacts.

DOE and EPA will strengthen the two agencies' common efforts in fundamental modeling of atmospheric processes and the development of new methods and instruments to better measure and understand atmospheric aerosols. Through use of high performance computing, EPA and DOE will optimize regional and global scale air quality models to address the poorly understood relationship between air quality and climate, that may affect the ability to achieve air quality standards in the future.